

WHAT IS CLAIMED IS:

1. A telescopic shaft for a vehicle steering,  
assembled in a steering shaft of a vehicle and  
constructed by fitting a male shaft and a female  
5 shaft to each other so as to be unable to rotate but  
to be slidable, said telescopic shaft comprising:

a first torque transferring member interposed  
via an elastic member between one line of axis-  
directional groove and one line of axis-directional  
10 groove formed respectively on an outer peripheral  
surface of said male shaft and on an inner peripheral  
surface of said female shaft; and

a second torque transferring member interposed  
between another line of axis-directional groove and  
15 another line of axis-directional groove formed  
respectively on the outer peripheral surface of said  
male shaft and on the inner peripheral surface of  
said female shaft,

said elastic member including:

20 a transferring member sided contact portion  
abutting on said first torque transferring member;

a groove sided contact portion spaced away at an  
predetermined interval substantially in a peripheral  
direction from said transferring member sided contact  
25 portion and abutting on a groove surface of the axis-  
directional groove of said male shaft or said female  
shaft; and

a biasing portion elastically biasing said transferring member sided contact portion and said groove sided contact portion in such a direction as to separate from each other,

5            wherein a rigidity of said transferring member sided contact portion is differentiated from a rigidity of said groove sided contact portion.

2. A telescopic shaft for a vehicle steering  
10           according to claim 1, wherein said first torque transferring member is a rolling member rolling when both of said male shaft and said female shaft make relative movements in the axis-direction, and

             said second torque transferring member is a  
15           slide member sliding when both of said male shaft and said female shaft make the relative movements in the axis-direction.

3. A telescopic shaft for a vehicle steering  
20           according to claim 1 or 2, wherein said biasing portion of said elastic member takes a bent shape bent between said transferring member sided contact portion and said groove surface sided contact portion.

25           4. A telescopic shaft for a vehicle steering according to claim 1 or 2, wherein said elastic member is constructed of an integral molding product

made from thin plate spring steel.

5           5. A telescopic shaft for a vehicle steering  
according to claim 1 or 2, wherein surface hardness  
of said transferring member sided contact portion is  
set higher than surface hardness of a portion  
extending from said groove surface sided contact  
portion to said biasing portion.

10           6. A telescopic shaft for a vehicle steering  
according to claim 1 or 2, wherein said biasing  
portion is formed with holes for reducing a biasing  
force.

15           7. A telescopic shaft for a vehicle steering  
according to claim 1 or 2, wherein a plate thickness  
of said transferring member sided contact portion is  
set thicker than a plate thickness of a portion  
extending from said groove surface sided contact  
20           portion to said biasing portion.

            8. A telescopic shaft for a vehicle steering  
according to claim 1 or 2, wherein said transferring  
member sided contact portion is formed substantially  
25           in a circular arch shape.

            9. A telescopic shaft for a vehicle steering,

comprising:

5 a male shaft formed with first and second axis-directional grooves extending in an axis-direction on an outer peripheral surface at an interval of a predetermined angle;

10 a female shaft disposed coaxially with said male shaft, formed with third and fourth axis-directional grooves extending in the axis-direction on an inner peripheral surface in a way that corresponds to said first and second axis-direction grooves, and fitted onto said male shaft;

15 a first torque transferring member interposed between said first axis-directional groove of said male shaft and said third axis-directional groove of said female shaft;

an elastic member interposed between said first torque transferring member and said first axis-directional groove of said male shaft, and extending in the axis-direction;

20 a second torque transferring member interposed between said second axis-directional groove of said male shaft and said fourth axis-directional groove of said female shaft; and

25 said telescopic shaft being assembled in a steering shaft of a vehicle and constructed by fitting said male shaft and said female shaft to each other so as to be unable to relatively rotate but to

be slidable,

wherein said elastic member is integrally formed with a first contact portion at which the elastic member is in contact with said first torque  
5 transferring member, a second contact portion at which said elastic member is in contact with said groove surface of the male shaft, and a biasing portion holding elastically said members in the preloaded and contacted state with the first and the  
10 second contacting portions being spaced away from each other; and

the preload caused by said biasing member is so set not to exceed a tolerance value of a surface pressure at said second contact portion against said  
15 first torque transferring member.

10. A telescopic shaft for a vehicle steering according to claim 10, wherein said first axis-directional groove of said male shaft has groove  
20 sided surfaces exhibiting a line symmetry with respect to a diametrical direction and a groove bottom surface connecting said groove sided surfaces,

said first contact portion of said elastic member is constructed of transferring member sided  
25 contact portions each abutting on said first transferring member,

said second contact portion of said elastic

member is constructed of groove surface sided contact portions each abutting on said groove sided surface,

5       said biasing portion connecting said transferring member sided contact portion to said groove surface sided contact portion on the side of an outer diameter and biasing said two contact portions in such a direction as to separate from each other, and

10       said elastic member further integrally has a connecting portion connecting said transferring member sided contact portion to said groove surface sided contact portion on the side of an inner diameter.

15       11. A telescopic shaft for a vehicle steering according to claim 10 or 11, wherein said first torque transferring member is constructed of a plurality of spherical rolling members, and

20       said second torque transferring member is constructed of a needle roller.

ABSTRACT

A telescopic shaft for a vehicle steering, assembled in a steering shaft of a vehicle and constructed by fitting a male shaft and a female shaft to each other so as to be unable to rotate but to be slidable, the telescopic shaft, has a first torque transferring member interposed via an elastic member between one line of axis-directional groove and one line of axis-directional groove formed respectively on an outer peripheral surface of the male shaft and on an inner peripheral surface of the female shaft; and a second torque transferring member interposed between another line of axis-directional groove and another line of axis-directional groove formed respectively along the outer peripheral surface of the male shaft and along the inner peripheral surface of the female shaft. The elastic member includes a transferring member sided contact portion abutting on the first torque transferring member, a groove sided contact portion spaced away at an predetermined interval substantially in a peripheral direction from the transferring member sided contact portion and abutting on a groove surface of the axis-directional groove of the male shaft or the female shaft; and a biasing portion elastically biasing the transferring member sided contact portion and the groove sided contact portion

in such a direction as to separate from each other,  
wherein a rigidity of the transferring member sided  
contact portion is differentiated from a rigidity of  
the groove sided contact portion.